

REMOTE HIGH RESOLUTION PHOTOGRAPHY AND VIDEO RECORDING USING A STREAMING VIDEO AS A VIEW-FINDER

1 Technical Field

2 The technical field relates to remote photography, and, in particular, to remote
3 high resolution photography using a streaming video as a view-finder.

4 Background

5 With advancements in telecommunications, remote photography utilizing
6 electronic remote devices becomes increasingly desirable. A person often finds a scene
7 interesting or a moment worth remembering, only to discover that either no camera is
8 available to capture the image or he/she is not in the best position to take the picture.
9 Similarly, during a sports event, an audience typically is unable to take the best picture of
10 the game from a distance seat using a personal camera. In addition, a party in a
11 teleconference environment who wants to keep a photograph of another party will realize
12 that low resolution video transmission typically cannot generate high resolution pictures.

13 Remote photography is currently available in limited circumstances. For example,
14 theme parks normally provide electronic photography systems for capturing images of
15 customers participating in rides or events with digital cameras. The images are later sent
16 to the customers through a network after verification of customer information and/or
17 payment information. However, the electronic photography systems only randomly take
18 pictures of the customers, i.e., the customers have no active control over the digital
19 cameras regarding either timing or more advanced features, such as zooming. In addition,
20 the customers cannot preview any live-video before the image acquisition.

21 Summary

22 A method for acquiring remote high resolution photographs by a user using a
23 streaming digital video as a view-finder includes connecting a remote device controlled
24 by the user to one or more photo-video acquisition devices, acquiring a high resolution
25 photograph from the remote device using a video streamed from the one or more photo-
26 video acquisition devices as a view-finder, and processing and transmitting the video and
27 the high resolution photograph obtained from the one or more photo-video acquisition
28 devices, using a joint video and still image pipeline.

29 In one embodiment, the one or more photo-video acquisition devices request
30 payment information from a user who wishes to control the one or more photo-video
31 acquisition devices, verify the payment information submitted by the user, and enable the
32 user to control the one or more photo-video acquisition devices from the remote device.

1 The one or more photo-video acquisition devices may implement a queue system to allow
2 multiple users to control the one or more photo-video acquisition devices in turn.

3 In another embodiment, a network server stores the video and the high resolution
4 photograph, and either sends the video and the high resolution photograph to the user
5 upon payment or posts the video and the high resolution photograph on a web page.

6 **Description of the Drawings**

7 The preferred embodiments of the remote high resolution photography will be
8 described in detail with reference to the following figures, in which like numerals refer to
9 like elements, and wherein:

10 Figure 1 illustrates an exemplary joint video and still image pipeline;

11 Figure 2 illustrates an exemplary network and exemplary hardware components of
12 a computer that may be used in connection with an exemplary method for acquiring
13 remote high resolution photographs by a user using a streaming video as a view-finder;

14 Figures 3(a) and 3(b) illustrate how the exemplary joint video and still image
15 pipeline of Figure 1 enables a user to acquire remote high resolution photographs through
16 the exemplary network of Figure 2;

17 Figure 3(c) illustrates how the user may control a remote camera to acquire
18 remote high resolution photographs through a point-to-point connection.

19 Figure 4 is a flow chart illustrating the exemplary method of Figure 2 for
20 acquiring remote high resolution photographs by a user using a video streamed from a
21 remote camera as a view-finder; and

22 Figure 5 is another flow chart illustrating how a user acquires remote high
23 resolution photographs using a video streamed from a remote camera as a view-finder.

24 **Detailed Description**

25 Using a joint video and still image pipeline technology, a network may be
26 deployed through the Internet so that a user may acquire a remote high resolution
27 photograph using a low resolution video streamed from a remote camera as a view-finder.

28 *M>* Figure 1 illustrates an exemplary joint video and still image pipeline. The
29 *A/* exemplary joint video and still image pipeline is capable of delivering videos 120 and still
30 images 110, i.e., photographs, at the same time. For example, while a video 120 is being
31 viewed or recorded, a snapshot 102 may be taken to generate the still image 110. The
32 processing of the videos 120 and the still images 110 may be in parallel. The joint video
33 and still image pipeline is described, for example, in U.S. Patent Application, entitled
34 "Concurrent Dual Pipeline for Acquisition, Processing and Transmission of Digital Video

Att'd
1 and High Resolution Digital Still Photographs," filed on the same day herewith, which is
2 incorporated herein by reference.

3 The joint video and still image pipeline leverages existing processing from
4 cameras, i.e., demosaicing, color processing, and image compression. Additionally, the
5 joint video and still image pipeline takes advantage of existing expertise on digital video,
6 i.e., video compression and video streaming and transcoding. The still images 110
7 typically have high resolution with, for example, 2-4 mega pixels. The high resolution
8 still images 110 also have sophisticated demosaicing that leaves almost no demosaicing
9 artifacts and high quality color correction that generates accurate color. On the other
10 hand, the videos 120 typically have mid or low resolution with, for example, 640 x 480
11 resolution. In contrast to high resolution still images 110, the mid or low resolution
12 videos 120 have fast demosaicing and fast color correction, which produces high frame
13 rate. The video is then real time compressed and streamed with low delay and good error
14 protection.

15 Figure 2 illustrates an exemplary network 230 and exemplary hardware
16 components of a computer 220 that may be used in connection with an exemplary method
17 for acquiring remote high resolution photographs by a user using a streaming video 120
18 as a view-finder. The network 230, such as the Internet or other type of computer or
19 phone networks, connects a user's remote devices 222, 220 with one or more photo-video
20 acquisition devices 240. The remote devices 222, 220 may be a handheld device 222 or a
21 desktop computer 220, whereas the photo-video acquisition devices 240 may be remote
22 video cameras.

23 The computer 220 typically includes a memory 202, a secondary storage device
24 212, a processor 214, an input device 216, a display device 210, and an output device
25 208. The computer 220 is connected to the remote video cameras 240 through the
26 network 230, and may send commands to the cameras 240 and receive a streaming video
27 and image 120 from the cameras 240. The memory 202 may include random access
28 memory (RAM) or similar types of memory. The secondary storage device 212 may
29 include a hard disk drive, floppy disk drive, CD-ROM drive, or other types of non-
30 volatile data storage. The secondary storage device 212 may correspond with various
31 databases or other resources. The processor 214 may execute applications or other
32 information stored in the memory 202, the secondary storage 212, or received from the
33 Internet or other network 230. The input device 216 may include any device for entering
34 data into the computer 220, such as a keyboard, key pad, cursor-control device, touch-

1 screen (possibly with a stylus), or microphone. The display device 210 may include any
2 type of device for presenting visual image, such as, for example, a computer monitor, flat-
3 screen display, or display panel. The output device 208 may include any type of device
4 for presenting data in hard copy format, such as a printer, and other types of output
5 devices including speakers or any device for providing data in audio form. The computer
6 220 can possibly include multiple input devices, output devices, and display devices.

7 Although the computer 220 is depicted with various components, one skilled in
8 the art will appreciate that this computer can contain additional or different components.
9 In addition, although aspects of an implementation consistent with the present invention
10 are described as being stored in memory, one skilled in the art will appreciate that these
11 aspects can also be stored on or read from other types of computer program products or
12 computer-readable media, such as secondary storage devices, including hard disks, floppy
13 disks, or CD-ROM; a carrier wave from the Internet or other network; or other forms of
14 RAM or ROM. The computer-readable media may include instructions for controlling
15 the computer 220 to perform a particular method.

16 Figures 3(a) and 3(b) illustrate how the exemplary joint video and still image
17 pipeline enables a user to acquire remote high resolution photographs 110 through the
18 network 230. Referring to Figure 3(a), the network 230 enables a user 322 to connect to
19 one of the photo-video acquisition devices 240, such as remote video cameras, in the
20 network 230 and to receive a video signal 120 that is being captured by the remote
21 camera 240. In other words, the user 322 may use the received video signal 120
22 transmitted by the remote camera 240 as a view-finder on the hand held device 222 or the
23 desktop computer 220. When the user 322 perceives an interesting scene on the view-
24 finder, the user 322 may take a high resolution photograph 110. If the cameras 240 are
25 fixed, i.e., cannot be controlled or moved by any user 322, multiple users 322 can take
26 high resolution photographs using a same camera 240 simultaneously.

27 Alternatively, a remote camera 240 may be controlled by a user 322, as illustrated
28 in Figure 3(b). In order to control one of the cameras 240 for remote photography, the
29 user 322 may need to log onto the remote camera 240 and submit personal information,
30 such as internet protocol address, e-mail address, and payment information, such as credit
31 card number. Each remote camera 240 may be a microcomputer with a memory (not
32 shown), a microprocessor 340, an input device (not shown), an output device (not
33 shown), and a network connection (not shown), similar to the computer 220. The
34 microprocessor 340 in the remote camera 240 may verify the user's payment information

1 before granting access of control to the user 322. Verification of customer information is
2 described, for example, in United States Patent No. 6,222,646, to Maurinus, et. al.,
3 entitled "Electronic Photography System," which is incorporated herein by reference.

4 In addition, the microprocessor 340 may implement a queue system for multiple
5 users 322 to control the same camera 240. With the queue system, only after a previous
6 user 322 logs off the camera 240, may another user 322 log onto the same camera 240
7 and exercise control 361. The control 261 may include tilting the remote camera 240 up
8 or down, turning the camera 240 to the left or right, re-focusing the camera 240, or
9 zooming the camera 240. The microprocessor 340 also controls motors in the remote
10 camera 240 to perform the control commands received from the user 322.

11 The user 322 may use the remote camera 240 to view and record videos 120, as
12 well as audio sounds. The user 322 may also acquire high resolution photographs 110,
13 i.e., high resolution still images, at any time, using the video 120 streamed from the
14 remote cameras 240 as a view-finder. The videos 120 and high resolution photographs
15 110 may be processed and transmitted using the joint video and still image pipeline, 320
16 and 310, respectively. Transmission of high resolution still images is described, for
17 example, in United States Patent No. 6,108,027, to Andrews, et. al., entitled "Progressive
18 Still Frame Mode," which is incorporated herein by reference.

19 After the videos 120 and/or the high resolution photographs 110 are acquired, the
20 videos 120 and/or the high resolution photographs 110 may be saved in a storage 350 on a
21 network server, such as a multimedia database connected to the network 230. The
22 handheld devices 222 typically has bandwidth restrictions for video transmission,
23 whereas the network 230 may process high bandwidth transmission with high speed
24 connection. Therefore, while the user 322 receives low quality streaming video 120 on
25 the handheld device 222, the video 120 stored in the storage 350 may be of higher quality
26 than the streaming video 120 used as a view-finder. Alternatively, if the user 322
27 accesses the remote camera 240 from a desktop computer 220 with a high speed
28 connection to the network 230, the streaming video 120 used as a view-finder may be of
29 higher quality, due to the high bandwidth connection.

30 The videos 120 and/or the high resolution photographs 110 may be posted on a
31 web page or may be sent to the user 322, for example, by e-mail, once payment has been
32 secured. The user 322 may store the videos 120 and/or high resolution photographs 110
33 in a local secondary storage 212, and may print the high resolution photographs 110 on a
34 printer.

1 Figure 3(c) illustrates how the user 322 may control the remote camera 240 to
2 acquire remote high resolution photographs 110 through a point-to-point connection, such
3 as a direct wire connection, a infra-red remote control, or a telephone network. The user
4 322 typically connects to the remote camera 240 and receives low resolution video 120
5 through a communication channel, such as a direct wire connection, a infra-red channel,
6 or a telephone network channel, which are well known in the art. The user 322 may also
7 send control commands 362 to the remote camera 240 through a same or a different
8 communication channel. After high resolution photographs 110 are acquired, the
9 photographs 110 may be sent to the user 322 directly through similar channels or through
10 the network 230.

11 As one example, in a mobile environment, a user 322 may use a handheld device
12 222, such as a cell phone or a handheld computer, to control and acquire high resolution
13 photographs 110 using one of the remote cameras 240 in the network 230. The cameras
14 240 may be specially positioned to acquire from a wide angle pictures of, for example, a
15 theme park, so that users 322 may acquire high resolution pictures 110 of themselves in
16 the theme park using a streaming video 120 obtained from the remote cameras 240 as a
17 view-finder. The high resolution photographs 110 may later be posted on a web page or
18 emailed to the users 322 upon payment.

19 As another example, in a video conferencing environment where low resolution
20 videos 120 are transmitted through a network, a party 322 may use another party's
21 camera 240 to acquire a high resolution photograph 110 of the other party.

22 As yet another example, in a sports event, a user 322 may watch the sports event
23 from a handheld device 222 through a remote camera 240 perfectly positioned to deliver
24 the best view of the event. Using the handheld device 222, the user 322 may also record
25 the entire event and/or acquire a high resolution photograph 110 using a video 120
26 streamed from the remote camera 240 as a view-finder.

27 Figure 4 is a flow chart illustrating an exemplary method for acquiring remote
28 high resolution photographs 110 by a user 322 using a streaming video 120 as a view-
29 finder. Step 410 involves connecting a remote device of the user 322, such as a handheld
30 device 222 or a desktop computer 220, to one or more photo-video acquisition devices
31 240, such as remote video cameras, through a network 230 or other means, such as a
32 direct wire connection, an infra-red remote control, or a telephone network. In order to
33 exercise control over one of the remote cameras 240, the user 322 may need to provide
34 payment information to the remote camera 240, step 412. After a microprocessor 340 in

1 the remote camera 240 verifies the payment information submitted by the user 322, step
2 414, the user 322 may control the remote camera 240 from the remote device, step 416.
3 The microprocessor 340 may implement a queue system to allow multiple users 322 to
4 control a same remote camera 240 in turn, step 418.

5 Next, the network 230 enables the user 322 to view the video 120 streamed from
6 the remote camera 240 and to acquire a high resolution photograph 110 from the remote
7 device, using the streaming video 120 captured by the remote cameras 240 as a view-
8 finder, step 420. The video 120 and the high resolution photograph 110 may be
9 processed and transmitted in parallel using a joint video and still image pipeline, step 430.
10 Accordingly, whatever the user 322 perceives on the view-finder is exactly what the user
11 322 photographs, as in a single lens reflex (SLR) camera. The network 230 may store the
12 video 120 and/or the high resolution photograph 110 in a storage 350 on a network server,
13 step 440. The stored video 120 may be of higher quality than the streaming video 120
14 used as a view-finder. The video 120 and/or the high resolution photograph 110 may then
15 be sent to the user 322 upon payment, step 442. Alternatively, the video 120 and/or the
16 high resolution photograph 110 may be posted on a web page, step 444, which enables
17 the user 322 to download to a remote device, such as a desktop computer 220, step 446.

18 Figure 5 is another flow chart illustrating how a user 322 acquires a remote high
19 resolution photograph 110 using a streaming video 120 as a view-finder. First, the user
20 322 logs onto a network 230 from a remote device, such as a handheld device 222 or a
21 desktop computer 220, step 510. The user 322 then selects a photo-video acquisition
22 device 240, such as a remote video camera, in the network 230 for acquiring the high
23 resolution photograph 110, step 520. The user 322 may need to submit payment
24 information, step 530, in order to control the remote camera 240 through the network 230,
25 step 540. Next, the user 322 views the streaming video 120 and acquires the high
26 resolution photograph 110 from the remote device using the video 120 streamed from the
27 remote camera 240 as a view-finder, step 550.

28 The user 322 may receive the video 120 and/or the high resolution photograph
29 110 on a remote device, such as a desktop computer 220, from the network 230, step 560,
30 and store the video 120 and/or the photograph 110 in a local storage 212 connected to the
31 desktop computer 220, step 570. Finally, the user 322 may print the high resolution
32 photograph 110 on a printer connected to the desktop computer 220, step 580.

33 While the method and apparatus for acquiring remote high resolution photographs
34 using a streaming video as a view-finder have been described in connection with an

1 exemplary embodiment, those skilled in the art will understand that many modifications
2 in light of these teachings are possible, and this application is intended to cover any
3 variations thereof.